

ENDANGERED SPECIES

The Elusive Delta Smelt

*Export pumping has little affect on delta smelt
and they could be wakasagi anyway.*

To those who depend on the Sacramento/San Joaquin Bay-Delta for their water, keeping track of the delta smelt and recognizing it apart from other fish is critically important. Unless done properly, protection for the fish — listed as "threatened" under the federal Endangered Species Act — can create unnecessary disruptions in the state and federal pumps that export much of the water used south of the Delta.

This is not a minor issue. Over 20 million urban water users — nearly 10% of the U.S. population — and farms that grow about 45% of the nation's fruits and vegetables rely heavily on these exports.

We're now beginning to find out that even the most expert delta smelt biologists know little about its actual habits and movements and often mistake it for other species. Much of the conventional knowledge of the fish is based on conjecture and scientific theory.

In fact, some of the principal data provided by biologists to convince the U.S. Fish and Wildlife Service to list the fish under the ESA in March 1993, has

since been invalidated.

For example, in the published declaration for the listing, biologists stated that the primary threat to the fish are "large freshwater exports from the Delta" for agriculture and urban use. It goes on to say that during high export pumping at the Central Valley Project and State Water Project plants in the south Delta, delta smelt become disoriented, dislocated from their spawning areas with "large mortalities occurring as a result of entrainment at the pumps."

There's no doubt that some delta smelt become entrained in screens at the two plants, but a major experiment conducted last year by the Department of Water Resources showed that increased pumping at the plants had no real effect on dislocating or entraining the fish.

The study examined whether or not a statistically significant increase in juvenile smelt abundance would occur at sampling locations within the zone of influence of the pumps as a direct result of an increase in water project exports. The relationship was also explored at

see Delta Smelt page 8

Coming oming Next Month . . .

New Bureau of Reclamation?

Has the departure of Dan Beard as commissioner of the federal Bureau of Reclamation changed anything at the agency? If the Bureau's recently revised "white paper" on the management of the 800,000 acre-feet of water dedicated to fish and wildlife under the Central Valley Project Improvement Act is any indication, then the answer is Yes. See a summary of the paper in next month's CWJ.

Landmark Bill Ties Development to Water Supply

Both Houses of the state Legislature passed the landmark bill requiring cities and counties to consider the availability of water before building new suburbs.

For years, Californians have operated on the premise that you build a suburb first then take water from existing residents and farmers. The new law will require local governments to consult with local water agencies about the source and availability of water for new subdivisions. Next month, we'll look at the bill and examine the state's recent report on "sprawl" and its effect on water supplies.

Dr. Moyle's Smelt Response

Last month we promised to reveiw the response from biologist Dr. Peter Moyle to suggestions that the Delta smelt is not a unique species. Unfortunately, we ran out of time and space but will try again next month.

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Computer Upgrade Bytes CWJ

Upgrading the 486/DX33 computer (now considered a dinosaur) we use for writing the CWJ didn't go very well. Wrong CPU chip, then wrong BIOS chip, then wrong voltage regulator chip. The errors delayed publication and we apologize for that. However, we finally got the whole thing back together and it's working fine — as a 486/DX33.

Delta smelt from page 1

sampling locations throughout the Delta. The investigation detected no significant changes in the distribution of smelt in response to the increased export rate. Indeed, the fish's distribution remained similar during both low and high exports.

The results of the experiment revealed that real-life interactions between water project operations and the distribution and losses of delta smelt don't follow the theory held by biologists.

"The zone of influence of the pumps under the study's conditions for delta smelt wasn't as great as conventionally thought," said Leo Winternitz of DWR, which commissioned the research. "Now we have empirical evidence on actual impacts — before only theoretical impacts have been used to regulate flows."

The DWR experiment has laid the groundwork for plans under the December 1994 Bay-Delta Accord that could significantly change the way we protect the Delta's biological resources in the future. One program currently in development under CALFED, the overseer of the delta agreement, proposes to completely abandon theoretical management of the south Delta pumps. Instead, delta smelt and other targeted species will be tracked via a network of monitoring stations located throughout the Delta. Decisions about pumping at the CVP and SWP plants will be made based on the actual presence of targeted fish.

Delta Smelt or Wakasagi?

Also coming to light is the great amount of confusion distinguishing delta smelt from wakasagi in the Delta. Biologists are discovering that a large number of smelt in the Delta are not delta smelt at all but are instead wakasagi.

Wakasagi is a smelt native to Japan and was first introduced in California in 1959 in six Central Valley reservoirs as a forage fish. For many years, biologists considered the delta smelt and the wakasagi the same species. In 1970, based on minute differences in skull morphology, a biologist identified the delta smelt and wakasagi as two separate species. It wasn't until 1991, more than 20 years later, that scientists, primarily at UC Davis, finally agreed to the two species designation. At the same time, the Davis group and a group of biologists at the State Department of Fish and Game were promoting the delta smelt as an endangered species.

At one time it was thought wakasagi lived primarily in reservoirs and delta smelt stayed only in the Delta. However, reports show that wakasagi are now widespread in the delta and are competing and hybridizing with delta smelt.

DFG data show that wakasagi has been seen occasionally in the Delta for at least 13 years. However, since it's virtually impossible tell a delta smelt from a wakasagi, they could have been there much longer.

Smelt biologists suggest wakasagi could be coming from large populations of the fish in Folsom and Oroville reservoirs. Over the years, what have been described as wakasagi have been collected from the American River, the upper and lower Sacramento River, the Delta and even the San Luis Reservoir south Delta export pumps.

How to Tell the Fish Apart

A recent genetic test conducted on several varieties of smelt including the delta smelt and wakasagi was considered inconclusive by some biologists. This means if you need to identify a delta smelt, you have to do it visually, and that's nearly impossible.

At the larvae stage, the two fish and their hybrids are visually identical. At the adult stage, it takes an expert biologist with a 10X magnifying glass to recognize a delta smelt but it could turn out to be a wakasagi. Is sounds confusing and it is.

To help biologists differentiate the fish, DFG collected smelt from several

reservoirs and the Delta for the purpose of deriving rules by which the fish can be visually recognized.

Here are the DFG rules:

• Location (Not Acceptable)

Since delta smelt and wakasagi are both present in the Delta, location is not a determining factor in differentiating the two fish.

• Appearance (N/A)

Even the most expert delta smelt biologist cannot distinguish between delta smelt and wakasagi with the naked eye. A close-in examination with a magnifying glass is required.

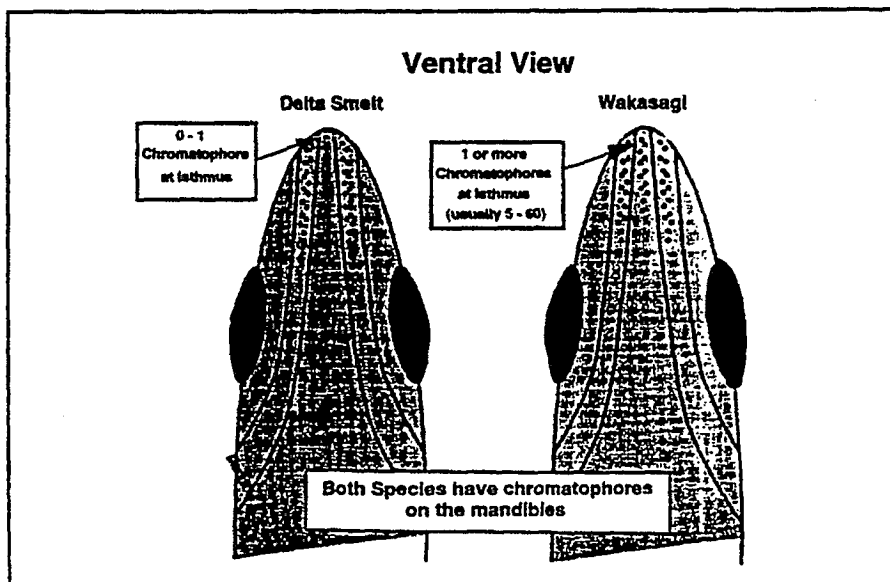
• Dorsal Pigmentation (N/A)

Of the fish analyzed, 50% of the delta smelt overlapped in pigment classes with wakasagi. Therefore, DFG suggests that dorsal pigmentation not be used as a basis for species identification.

• Fin Ray Counts (N/A))

The survey verified that using only fin ray counts for species identification is ambiguous for about 90% of both fish. The following table shows that the number of fin rays overlap for both fish. Therefore, DFG recommends that fin ray counts not be used as a basis for species identification.

	Delta Smelt	Wakasagi
Dorsal Fin	8-11	8-11
Anal Fin	15-19	14-17
Pectoral Fin	10-12	11-14
Pelvic Fin	8-9	8



Delta smelt have only one or no spot on the Isthmus unless it's a wakasagi with only one spot. (Isthmus is the center section of the lower jaw between the mandibles)

• Chromatophores

According to the DFG guidelines, examining the number of chromatophores (spots) on the underside of the fish's lower jaw is the only sure method to differentiate delta smelt from wakasagi. And, only the spots on the isthmus, the middle section of the lower jaw between the two mandibles, are important.

Delta smelt have 0 or 1 spot on the isthmus and wakasagi have from 1 to 60 spots. (See diagram)

It comes down to a single freckle. If the fish has no spot on the isthmus, it's a delta smelt. If it has more than one spot, it's a wakasagi. If it has only one spot and all other conditions overlap, it could be a delta smelt or a wakasagi.

DFG says a 10X hand-held magnifying lens (jeweler's lupe) appears to give enough magnification to properly count the chromatophores on the isthmus. For easier viewing, DFG recommends opening the mouth to separate the mandibles from the isthmus.

Is the Delta Smelt a Wakasagi?

This data from DFG was published in early 1995, and according to the report, is the most up-to-date information currently available on the identification of delta smelt from wakasagi.

The idea that only a few spots on the lower jaw provide the primary distinction between the two fish is strong evidence that the delta smelt and wakasagi are the same species.

However, it's expected that delta smelt biologists aren't going to let go of the classifications very easily. In a recent article, UC Davis Professor Peter Moyle points out that even though delta smelt and wakasagi are interbreeding in the Delta, there's no evidence their offspring are fertile. The ability to produce fertile offspring is the classic qualifier for separating species. For example, when horses are mated with donkeys, they produce mules, but mules are infertile and cannot reproduce their own kind. Consequently, horses and donkeys are two different species. Professor Moyle is considered the foremost expert on delta smelt and is the one who petitioned it for protection under the federal Endangered Species Act.

The acid test for delta smelt is if experimental breeding with wakasagi was to take place for the purpose of determining if the two can produce fertile off-

spring. If the delta smelt turns out to be a common wakasagi, it could then be immediately removed from the endangered species list. Wakasagi are native to Japan and the federal endangered species list is restricted to plants and animals native to the United States.

Bay-Delta Accord Influence

Such experiments could be funded and conducted under the December 1994 Bay-Delta Accord. Through CALFED, significant changes are taking place in the way the Delta and its biological resources are managed.

Defined in the agreement is a new management scheme for the Delta called the *Long-term Adaptive Management Strategy*. The strategy is based on the idea that responsibility for mending past abuses of the Delta is to be shared among all those who benefit from it.

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Among the major points the policy-makers made when putting together the agreement are:

- 1) They want the Delta, as best it can, to function as a natural ecosystem.
- 2) They want to know how the ecosystem functions and what relationships drive the biology.
- 3) Over time, they want to know if the water quality standards in the agreement — and promulgated by the State Water Resources Control Board — are improving the overall health of the ecosystem.
- 4) They want all Delta stakeholders to participate as much as possible in managing its resources.

Real-Time Bay-Delta Monitoring

One CALFED program already underway is the *Real-time Bay-Delta Fish Monitoring Program*. A vast improvement over anything else tried in the past, the program will, for the first time, provide reliable data on fish movements throughout the Delta.

Early on, the program will specifi-

cally track the movements in the Delta of delta smelt and chinook salmon — with the emphasis on delta smelt. Later, it will include splittail, longfin smelt, and other species.

Fish movements will be monitored at about 13 sites in the Delta with the data relayed to CALFED scientists and summarized into a computer database. Managers will then be able to make decisions regarding south Delta pumping based on data that is no more than 48 hours old.

The goal is to reduce the overall losses of entrained fish at the pumping plants in the south Delta at no net additional water supply cost to CVP and SWP water users. For example, if the susceptibility of a targeted fish to loss is greater at the SWP pumps, then export pumping could be shifted to the CVP pumps if no fish are in that vicinity. Fish losses would be reduced over combined use of both facilities at no net water cost.

Under another set of circumstances, export pumping at both facilities could be reduced if the monitoring stations detect high densities of targeted species in the channels leading towards both pumping plants. Reduced pumping levels would result in less take. Higher pumping levels would be resumed once biological monitoring indicates that the targeted species are no longer in the established zone of influence.

The monitoring program is not yet fully implemented. However, experiments were conducted in May and June of this year. The results are still being examined to determine if it will become a standard procedure.

CALFED Brings Interests Together

A significant feature of the program is that monitoring and decisions on pumping levels will be conducted by a consortium interests. In the past, these determinations were made almost exclusively by state and federal wildlife agencies. Under CALFED, individuals from the U.S. Fish and Wildlife Service and the DFG will still be involved, but they'd joined by scientists and engineers from the Department of Water Resources, the Bureau of Reclamation and urban and agricultural water agencies.

With the stakes so high in the Delta, similar programs with broad participation among Delta stakeholders could and should be implemented to study the biology and social habits of the delta smelt, winter run salmon and other critical wildlife inhabitants in the Delta.

POTPOURRI

The Winter-Run Salmon Caper

For sometime now, water users south of the Delta have suspected that federal wildlife officials don't count winter-run salmon very well at the state and federal pumping plants. This is especially true when officials say they've counted the maximum allowable take of smolts of the federally protected fish and, therefore, must shut down the pumps.

When the pumps stop, water users go without and suspicions rise.

The method to determine the allowable take at the pumping plants is anything but straight forward. Here's a simplified synopsis of how it goes:

They start by counting adult fish. During the period adult winter-run salmon are migrating through the Delta to spawn, federal officials sit streamside and record the number they see in a given time period. From that sample, they estimate the total number of adult spawning fish. Using that number, scientists then estimate the amount of fry these adults can be expected to produce and how many would, under normal conditions, survive to become smolts.

Officials then must try to calculate the number of fish that have met their doom, either by being sucked through protective fish screens into water project pumps or by being consumed by predator fish when trapped near the screens. It's at this point that a glitch in the system occurs.

Since it's impossible to count the fish sucked through the screens or eaten, scientists count the ones saved at the

screens. For each one saved, researchers assume that some are lost.

The National Marine Fisheries Service has determined that 1 percent of the estimated salmon smolts entering the Delta is an allowable take by the state and federal water projects. This year that 1 percent amounted to 905 fish. Should the number reach 905, the pumps, which divert water to cities and farms around the state, are shut down. Such a shut-down would likely cause water shortages up and down the state among urban and agricultural water users.

On March 29 this year, with the take count already at 730 and the winter-run out-migration at full throttle, the Department of Water Resources voluntarily stalled State Water Project pumps for just five days, fearing they'd get to 905 and have to shut down until May 31, the end of the run. But in its news release announcing the shutdown, the department included this surprise statement — "Recently acquired scientific evidence suggests that this estimate is too high and that this year's take is still far below the 1 percent allowed."

At the heart of the controversy are the fish at the screens. Are they native-bred winter-run or are they late fall-run salmon hatched at local fish hatcheries?

In most cases chinook salmon identified at the screens as winter-run are classified as such because their size falls within winter-run range. Size has been the criteria for distinguishing the protected winter-run from other races. However, nearby hatcheries producing late

fall-run release fish of a similar size.

To find out if NMFS was counting late fall-run salmon as winter-run, DWR covertly tagged a small percentage of fall-run from a nearby hatchery. Sure enough, of the 169 salmon saved near the pumps this year, and counted by NMFS as winter-run, 76 carried the DWR hatchery fish tags. Since only a small percentage of the fall-run were tagged, and nearly half of the fish at the screens had tags, it's pretty safe to assume that most, or all, of the 93 untagged fish were late fall-run. Based on the evidence, there were very few or no winter-run taken at the pumps this year.

"The procedure simply isn't working," said George Baumli, recently retired general manager of the State Water Contractors. "Of the fish saved at the screens, I don't think one has been positively determined to be a winter-run chinook salmon."

The contractors, along with the East Bay Municipal Utility District, now are paying for tagging of Mokelumne River fall-run hatchery salmon in an attempt to keep these fish from being counted at the pumps as winter-run.

The data will eventually be turned over to CALFED, the state/federal work group that will finalize Bay-Delta ecological programs under the 1994 Bay-Delta Accord.

From a recent article by Gary Hofer appearing in "Aqueduct" an official publication of the Metropolitan Water District of Southern California.

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